11. (Amended) The autostereoscopic image display device according to claim 1, wherein the divided areas are divided uniformly.

12. (Amended) The autostereoscopic image display device according to claim 1, wherein control of each of the divided areas is provided so as to supply an image for a dominant eye to the dominant eye of the viewer.

13. (Amended) The autostereoscopic image display device according to claim 1, wherein the shading part of the shading means is structured so that the shading part disappears in an optional area so as to display a two-dimensional image on a display area corresponding to the optional area.

REMARKS

The Office Action dated October 24, 2001 has been received and carefully noted. The above amendments to the claims, the specification and the following remarks, are submitted as a full and complete response thereto. By this Amendment, claims 1-6 and 8-13 are amended and claim 7 is canceled and the subject matter thereof incorporated into claim 1. No new matter is added. Consideration of claims 1-6 and 8-13 is respectfully requested.

The drawings are objected to as not containing all the features of claims 4, 7 and 9. It is respectfully submitted that the features of the claims 4, and 9 are illustrated. Specifically, the elements of claim 4 include an image display means (1) shown in Fig. 9, a liquid crystal display panel (20) shown in Fig. 12, the shading means which includes the shading barrier (10) shown in Fig. 12, and a light source (30) shown in Fig. 12.

The elements of claim 9 include a liquid crystal shutter provided on both sides of the continuous shading part, which correspond to the transparent electrodes 10a1 (10a2) or 10c1 (10c2). Claim 9 also includes an aperture part 151, 152, as shown in Figs. 28, 29, 30, 31, 35, and 36. The boundary part is the boundary of the divided areas of the shading means, as discussed on page 45, line 14, page 46, line 2, and shown in Figs. 28-31, 35 and 36. Thus, it is respectfully submitted that the features of claims 4, and 9 are illustrated in the drawings. Furthermore, Figures 33 and 34 are amended to more clearly recite the

features of the claims invention. Accordingly, Applicants request the withdrawal of the objections to the drawings.

The Office Action rejected claims 1-13 under 35 U.S.C. § 112, first paragraph, as containing subject matter not described in the specification in such a way as to enable one skilled in the art to make and/or use the invention. Claims 1-13 are amended to more clearly and distinctly recite the features of the claimed invention. It is respectfully submitted that support in enabling the claimed invention is provided in the specification of the present application.

Specifically, support for the limitations of claim 1, 7, and 9 can be found on page 17, lines 4-page 19. Additionally, support for claims 1 and 7 can be found on page 17, lines 11-page 18, line 2, which discusses that the shading barrier 10 has a function of shifting the shading part by ¼ of its pitch. The liquid crystal panel 20 is composed of a transparent electrode of ITO for turning the shading barrier 10 on and off and subdividing the liquid crystal panel 20 to make the shifting of the shading part possible. The shading barrier 10 is turned on and off so that one aperture corresponds to two pixels displayed on the liquid crystal display panel 20. It should be noted that the shading part of the shading barrier consists of a combination of a continuous shading part 10b and a transparent electrode 10a1 (10a2) or 10c1 (10c2). Thus, support for claim 9 can be found on page 8, lines 5-9, page 18 and Fig. 13. Also, page 18 discusses that polarization plates 14, 16 are attached to the liquid crystal display panel. In addition, page 18, lines 21- page 19, discusses the operation of the continuous shading part 10b.

Furthermore, the specification provides on page 23, lines 5-20 a discussion of the operation of the shading barrier dividing control circuit 11, which controls the ON/OFF of the liquid crystal shutter part of the shading barrier 10, and controls the positions of the shading part and a light transmitting part of the shading barrier 10. The specification also provides several examples explaining how the liquid crystal display panel may be divided into two, three or four areas, on pages 27, 36, and 43, respectively. Thus, it is submitted that support for the claimed features of the present invention to provide an enabled invention is provided. Accordingly, Applicants respectfully request the withdrawal of the rejection of claims 1-6 and 8-13 and 35 U.S.C. §112, first paragraph.

Claims 1-6 and 8-13 are rejected under 35 U.S.C. §112, second paragraph as being

indefinite. Claims 1-6 and 8-13 are amended to more clearly and distinctly recite all the features of the claimed invention. Thus, Applicants respectfully request the withdrawal of the rejection of claims 1-6 and 8-13 under 35 U.S.C. §112, second paragraph.

Claims 1-13 are rejected under 35 U.S.C. § 102(e) as anticipated by Hamagishi (U.S. Patent No. 6,049,424). The Office Action alleges that Hamagishi discloses every element of claims 1-13. Applicants submit that the each of these claims recites subject matter which is neither disclosed nor suggested in the prior art.

Claim 1, upon which claims 2-6 and 8-13 depend, is directed to an autostereoscopic image display device. The device comprises an image display means for displaying a left eye image and a right eye image alternately forming strip-shaped patterns upon a liquid crystal display pane, and a sensor for sensing a position of a head of a viewer. The device also comprises a shading means comprising a continuous shading part having a first and a second side and a liquid crystal shutter part for turning on and off based upon the position of the head of the viewer, wherein a shiftable shading part is provided on both the first and the second sides of the continuous shading part to generate a binocular parallax effect. The device also comprises an area shifting and division control means for dividing the shading means into an area in a horizontal direction and controlling shifting of a shiftable shading part in each of the areas.

The claimed invention provides numerous advantages which are neither taught nor suggested by the applied prior art. For instance, the present invention provides autostereoscopic image display device capable of ensuring a stereoscopic view in a position from an optimum viewing position with a large distance in a back and forward directions. Thus, the prior art does not teach or suggest a shading means comprising a continuous shading part having a first and a second side and a liquid crystal shutter part for turning on and off based upon the position of the head of the viewer, wherein a shiftable shading part is provided on both the first and the second sides of the continuous shading part to generate a binocular parallax effect, thus, providing the advantage of enlarging the area of the stereoscopic image. Thus, it is respectfully submitted that the prior art fails to disclose or suggest the features of the Applicants' invention, and therefore fails to provide the advantages which are provided by the claimed invention.

Hamagishi discloses a three dimensional (3D) display device, which includes a sensor for sensing the position of the head of the viewer 2 and a barrier movement means

for laterally moving a shading barrier 10 from the initial position when the sensor senses that the head of the viewer 2 is in a position whereby normal 3D images cannot be viewed , i.e., in a moire position. (Hamagishi, col. 8, lines 25-31). In Hamagishi, the barrier movement means includes a machine mechanism for mechanically moving the shading barrier 10. The barrier movement means includes liquid crystal shutters 31 and 32 arranged in both ends in the lateral direction of the slit 11 of the shading barrier 10 fixedly located, as shown in FIGS. 5 and 6, and a control circuit unit for selectively turning the liquid crystal shutters 31 and 32 on and off upon input of an output of the sensor. (Hamagishi, col. 8, lines 32-41). When the sensor senses that the viewer cannot view 3D images in the normal position, the slit 11 of the shading barrier 10 may be moved so that the center of the moiré position becomes the center of the normal view position. (Hamagishi, col. 8, lines 51-55).

It is respectfully submitted that Hamagishi does not teach or suggest every element of these claims. Accordingly, Hamagishi does not anticipate claims 1-6 and 8-13. For instance, Hamagishi does not teach or suggest a continuous shading part having a first and a second side and a liquid crystal shutter part for turning on and off based upon the position of the head of the viewer, wherein a shiftable shading part is provided on both the first and the second sides of the continuous shading part to generate a binocular parallax effects. Thus, the invention of claim 1 is configured so that not all of the barriers are shifted when the shading means shifts. Thus, the claimed invention is capable of determining based upon the viewer's position whether the liquid crystal display panel will be divided, for example, into two, three or four areas, and which of the barriers assigned to each divided areas will be shifted when the shading means shifts. Thus, Applicants submit that Hamagishi does not anticipate all of the elements of claims 1-6 and 8-13. Accordingly, Applicants respectfully request the withdrawal of the rejection of claims 1-6 and 8-13.

Claims 1, 3, 5, 6 and 11-13 are rejected under 35 U.S.C. § 102(b) as anticipated by Isono et al. (U.S. Patent No. 5,315,377). The Office Action alleges that Isono teaches all of the elements of claims 1, 3, 5, 6 and 11-13. Applicants respectfully submit that claims 1, 3, 5, 6 and 11-13 recite subject matter that is neither taught nor suggested by Isono.

Isono discloses a three-dimensional (3D) autostereoscopic image display device having a barrier display section. In the barrier display section, the number of parallax barriers, width aperture ratio of the barriers, the shape of the barriers including the number

of the barrier intervals, and the position of the barriers can be programmable controlled in accordance with an instructed input. The head position of the observer who observes the 3D image is monitored by a head detection unit. The detecting unit 8 detects the head position of the viewer and generates a display control command to the computer 20 when the head position of the viewer has moved by a predetermined distance.

Thus, during the operation of the head positioning detecting unit, the movement of the head position is detected and the detecting unit 8 generates a barrier phase shift command to the computer 20. In response to the barrier phase shift command, the computer 20 controls the controller 20 so as to shift the position of a stripe barrier by a distance corresponding to one image element. When a rotation command from the input unit 6 or a phase shift command from the detecting unit 8 is supplied as a display control command, the computer 20 generates a barrier movement command to the controller 22. In response to the barrier movement command, the controller 22 drives the drivers 24 and 26 in such a manner that the parallax barrier displayed on the panel 28 is shifted to the right or left by a distance corresponding to one pixel or one image element.

Although Isono discloses an autostereoscopic image display device using a parallax barrier method, Isono does not disclose or suggest an autostereoscopic image display device which is configured so that the a continuous shading part having a first and a second side and a liquid crystal shutter part for turning on and off based upon the position of the head of the viewer, wherein a shiftable shading part is provided on both the first and the second sides of the continuous shading part to generate a binocular parallax effect. Thus, Isono is not capable of selectively deciding which barriers are individually shifted based upon the viewer's position. Thus, Isono does not anticipate claims 1, 3, 5, 6, and 11-13. Accordingly, Applicants request the withdrawal of the rejection of these claims.

Claims 2, 4 and 10 are rejected under 35 U.S.C. § 103(a) as unpatentable over Isono et al. in view of Taniguchi et al. (U.S. Patent No. 6,094,216). The Office Action alleges that Isono discloses all of the elements of claims 2, 4, and 10 with the exception that the one pixel is one quarter of the pitch of the parallax barrier (claim 2), the parallax barrier being arranged between a light source and the image display panel (claim 4), and the number of divided areas increases as the head position of the viewer is apart from an optimum viewing position (claim 10).

Taniguchi discloses a stereoscopic image display method and apparatus, which

synchronizes an image displayed on a display with a slit pattern. The split pattern is displayed on a spatial light modulation element in pixel units or corresponding scan lines using a parallax barrier method. When a stereoscopic image is displayed on the display 1, light-transmission portions (slit portions) and light-shielding portions are horizontally arranged on the display surface of the element 2 at a predetermined pitch to form (or display) a parallax barrier pattern (slit pattern). An observation conditioning detecting means 30 detects the view point position of the observer, and the observation distance C is calculated in accordance with the detection result. Then, the width of each stripe pixel constituting the stripe image and the width B' of each slit portion of the parallax barrier pattern to be displayed on the spatial light modulation element 2 are approximately controlled in accordance with the calculated distance C. Taniguchi also teaches that the slit portions of the parallax pattern can be formed while shifting one pixel relative to the stripe image as shown in Fig. 11B.

However, Taniguchi does not overcome the shortcomings of Isono, as discussed above. Namely, the combination of Isono and Taniguchi fails to disclose or suggest an autostereoscopic image display device comprising continuous shading part having a first and a second side and a liquid crystal shutter part for turning on and off based upon the position of the head of the viewer, wherein a shiftable shading part is provided on both the first and the second sides of the continuous shading part to generate a binocular parallax effect. Therefore, the combination of Isono and Taniguchi does not render claim 1 of the invention obvious. Also, since claims 2, 4, and 10 depend from claim 1, claims 2, 4, and 10 should be allowable for the same reason that claim 1 is allowable and for the specific limitations recited within claims 2, 4, and 10, respectively.

Claims 7-9 are rejected under 35 U.S.C. § 103(a) as unpatentable over Isono et al. in view of Chikazawa (U.S. Patent No. 5,900,972). The Office Action alleges that Isono discloses all of the elements of claims 7-9 with the exception of a shading means that includes a continuous shading part and a liquid crystal shutter part. The Office Action relies upon Chikazawa to cure the deficiencies of the shading means including a liquid crystal shutter part. The Office Action takes Official Notice that the "shading means may include a continuous shading part" is an obvious matter of design choice.

Applicants respectfully request the Examiner to provide a reference to teach or suggest that the shading means may include a continuous shading part. Thus, Applicants

traverse the use of Official Notice, and therefore request a reference teaching this feature.

Chikazawa discloses a stereoscopic display system, which includes a movable barrier system 22 containing movable barrier strips. Chikazawa teaches that the movable barrier system may consist of a liquid crystal system 38, which includes strips of liquid crystal shutters 39 and 40, which are arranged along the pixel columns and function as the moving barriers 33.

It is respectfully submitted that Chikazawa does not overcome the shortcomings of Isono to render claims 7-9 obvious. Specifically, the combination of Isono and Chikazawa does not disclose or suggest an autostereoscopic image display device comprising a continuous shading part having a first and a second side and a liquid crystal shutter part for turning on and off based upon the position of the head of the viewer, wherein a shiftable shading part is provided on both the first and the second sides of the continuous shading part to generate a binocular parallax effect. Therefore, the combination of Isono and Taniguchi does not render claim 1 of the invention obvious. Consequently, claims 8 and 9 are allowable for the same reason that claim 1 is allowable and for the specific limitations recited within claims 8 and 9, respectively.

Claims 1-9 and 11-13 are also rejected under the judicially-created doctrine of obviousness-type double-patenting over claims 1-4, 6-7 and 11 of Hamagishi. To overcome the obviousness-type double patenting rejection, Applicants submit a terminal disclaimer regarding claims 1-9 and 11-13.

In view of the distinctions discussed above, withdrawal of the rejections to claims 1-13 is respectfully requested. Specifically, claims 1-6 and 8-13 have been amended to overcome the 35 U.S.C. 112, 102 and 103 rejections and claim 7 is cancelled. No new matter is presented. Also, the specification and figures are amended to more clearly recite the features of the claimed invention. It should also be noted that a terminal disclaimer is filed in regards to claims 1-6, 8, 9 and 11-13 Therefore, Applicants submit that the application is now in condition for allowance with claims 1-6 and 8-13 contained therein.

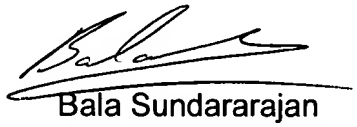
Should the Examiner believe the application is not in condition for allowance, the Examiner is invited to contact Applicants' undersigned attorney at the telephone number listed below.

In the event this paper is not considered to be timely filed, Applicants respectfully petition for an appropriate extension of time. The Commissioner is authorized to charge

payment for any additional fees which may be required with respect to this paper to Counsel's Deposit Account 01-2300.

Respectfully submitted,

Arent Fox Kintner Plotkin & Kahn



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Enclosures: Marked-Up Copy of Amended Claims
Marked-Up Copy of Specification
Approval of Drawing Corrections
Terminal Disclaimer
Petition for Extension of Time

MARKED-UP COPY OF THE SPECIFICATION

Page 1, Paragraph 1

A parallax barrier system and a lenticular lens system are well known as methods for displaying a stereoscopic image without special glasses. When these systems are used for structuring a stereoscopic image display device [without glasses] autostereoscopic image display device, the display device is generally structured so as to be a two-eye system because of limited resolution of a liquid crystal panel. The device of the two-eye system displays an image for a right eye and an image for a left eye on every alternate vertical line on a liquid crystal display panel 200 as shown in Fig. 1. A lenticular lens and a parallax barrier (not shown) are structured so that a viewer 2 in an optimum viewing position D can observe an image for a right eye and an image for a left eye alternately with a pitch of an interval between pupils E.

Page 4, Paragraph 3

This invention was made to provide a stereoscopic image display device [without glasses] autostereoscopic image display device capable of ensuring stereoscopic view in a position apart from an optimum viewing position with a great distance in back and forth directions. A stereoscopic image display device [without glasses] autostereoscopic image display device according to this invention comprises image display means for displaying a left eye image and a right eye image in alternate stripe shapes, shading means for shifting a position of a shading part for generating binocular parallax effect, and a sensor for detecting a head position of a viewer. The stereoscopic image display device includes area shifting and division control means for dividing the shading means into areas in a horizontal direction and controlling shifting of a shading part in each of the areas.

Page 9, Paragraph 7

Fig. 9 is a perspective view illustrating a stereoscopic image display device [without glasses] autostereoscopic image display device according to the embodiment of the present invention and a viewer;

Page 10, Paragraph 4

Fig. 14 is a block diagram illustrating a structure of the stereoscopic image display device [without glasses] autostereoscopic image display device according to the embodiment;

Page 14, Paragraph 2

A stereoscopic image display device [without glasses] autostereoscopic image display device according to the embodiment is structured so that a shading part of shading means for generating binocular parallax effect shifts by 1/4 of a pitch of the shading part as shown in JP 9-197344, A. With this structure, the shading means is divided into areas in a horizontal direction and the number of divided areas and whether or not the shading parts are shifted by 1/4 of its pitch in each of the areas are determined, and displaying of an image on a display area corresponding to the above area is controlled.

Page 14, Paragraph 3

Fig. 9 illustrates the viewer 2 watching a stereoscopic display device 1 [without glasses] autostereoscopic image display device. Sensors 101 for detecting a head position of the viewer 2 are mounted on upper ends of the stereoscopic display device 1 [without glasses] autostereoscopic image display device. Figs. 10, 11 illustrate a display 1a with shading means divided into three areas of H1, H2, and H3 when the sensors 101 detect the head of the viewer 2 shifts. When the shading means does not shift by a 1/4 pitch, the right and left eyes images respectively pass the areas R, L of "before shifting" in the figure. When the shading means shifts by a 1/4 pitch, the right and left eye images respectively pass the areas R', L' of "after shifting" in the figure. When replacing arrangement of the right and left eye images, a left eye image passes through the R, R' areas for originally passing the right eye image, and a right eye image passes through the L, L' areas for originally passing the left eye image.

Page 19, Paragraph 2

The pitch (Q) is formed so that a pair of the continuous shading part 10b and either of the transparent electrodes 10a1(10a2), 10c1(10c2) correspond to two pixels of the liquid crystal panel 20 in order to ensure stereoscopic viewing [without glasses] autostereoscopic image display device when the shading part is on. Either of the transparent electrodes 10a1 (10a2) or 10c1(10c2) for ensuring shifting of the shading part is turned on by corresponding to the

position of the viewer 2. A width of the transparent electrodes 10a1 (10a2) and 10c1(10c2) is formed so that a part not superimposing with the continuous shading part 10b is Q/4. Therefore, the shifting of the shading part by Q/4 is ensured by switching the ON/OFF of the transparent electrodes. The liquid crystal shutter comprises the transparent electrodes 10a1 (10a2) and 10c1(10c2).

Page 20, Paragraph 1

Fig. 14 is a block diagram illustrating a structure of the stereoscopic image display device [without glasses] autostereoscopic image display device. In this block diagram, the device according to the invention is applied to color display.

MARKED-UP COPY OF THE CLAIMS

1. (Amended) [A stereoscopic] An autostereoscopic image display device [without glasses] comprising:

an image display means for displaying a left eye image and a right eye image in [alternate stripe shapes] alternately forming stripe-shaped patterns upon a liquid crystal display panel; [shading means for shifting a position of a shading part for generating binocular parallax effect, and a sensor for detecting a head position of a viewer, wherein]

a sensor for sensing a position of a head of a viewer;

a shading means comprising a continuous shading part having a first and a second side and a liquid crystal shutter part for turning on and off, based upon the position of the head of the viewer a shiftable shading part provided on both the first and the second sides of the continuous shading part to generate a binocular parallax effect; and

area shifting and division control means for dividing the shading means into areas in a horizontal direction and controlling shifting of a said shiftable shading part in each of the areas.

2. (Amended) The [stereoscopic] autostereoscopic image display device [without glasses] according to claim 1, wherein
the shading means is so structured that a position of the shading part shifts by ¼ pitch of a pitch of the shading part.

3. (Amended) The [stereoscopic] autostereoscopic image display device [without glasses] according to claim 1, wherein
the shading barrier dividing control circuit [display control means for dividing] divides a display part of the image display means into areas [by corresponding division] to correspond to the divided areas of the shading means [into areas by corresponding to division of the shading means into the areas] and [controlling] controls a display order of the

left eye image and the right eye image [in stripe shapes] in each of the divided areas depending on [a head] the position of the head of the viewer [is provided].

4. (Amended) The [stereoscopic] autostereoscopic image display device [without glasses] according to claim 1, wherein
the image display means comprises [a] the liquid crystal display panel, the shading means is a shading barrier arranged between the liquid crystal display panel and a light source for emitting light in a flat shape arranged on a back side of the liquid crystal display panel.

5. (Amended) The [stereoscopic] autostereoscopic image display device [without glasses] according to claim 1, wherein
the shading means is a parallax barrier arranged on a light emission side of the image display means.

6. (Amended) The [stereoscopic] autostereoscopic image display device [without glasses] according to claim 1, wherein
the shading means comprises a liquid crystal panel.

8. (Amended) The [stereoscopic] autostereoscopic image display device [without glasses] according to claim [7] 1, wherein
an aperture part having aperture ratio is provided on the shading barrier means for permitting a viewer to observe pixels displayed on the liquid crystal panel;
[an] the aperture ratio configured to be equivalent to a boundary part of divided areas of the shading means is provided so that the aperture ratio and the boundary part of the divided areas are approximately uniform.

9. (Amended) The [stereoscopic] autostereoscopic image display device [without glasses] according to claim [7] 8, wherein
[a] the liquid crystal shutter provided on both the first and the second sides of the continuous shading part sandwiching the aperture part which is equivalent to the boundary part of each divided area is wired so as to be assigned in a same group of [a] the liquid crystal shutter in an [other adjacent] area adjacent to each divided area.

10. (Amended) The [stereoscopic] autostereoscopic image display device [without glasses] according to claim 1, wherein
the number of divided areas increases as the head position of the viewer [is apart] moves further away from an optimum viewing position.

11. (Amended) The [stereoscopic] autostereoscopic image display device [without glasses] according to claim 1, wherein
[division into] the divided areas are divided uniformly [provided].

12. (Amended) The [stereoscopic] autostereoscopic image display device [without glasses] according to claim 1, wherein
control of each of the divided areas is provided so as to supply an image for a dominant eye to the dominant eye of the viewer.

13. (Amended) The [stereoscopic] autostereoscopic image display device [without glasses] according to claim 1, wherein
the shading part of the shading means is structured so that the shading part disappears in an optional area so as to display a two-dimensional image on a display area corresponding to the optional area [without the shading part].